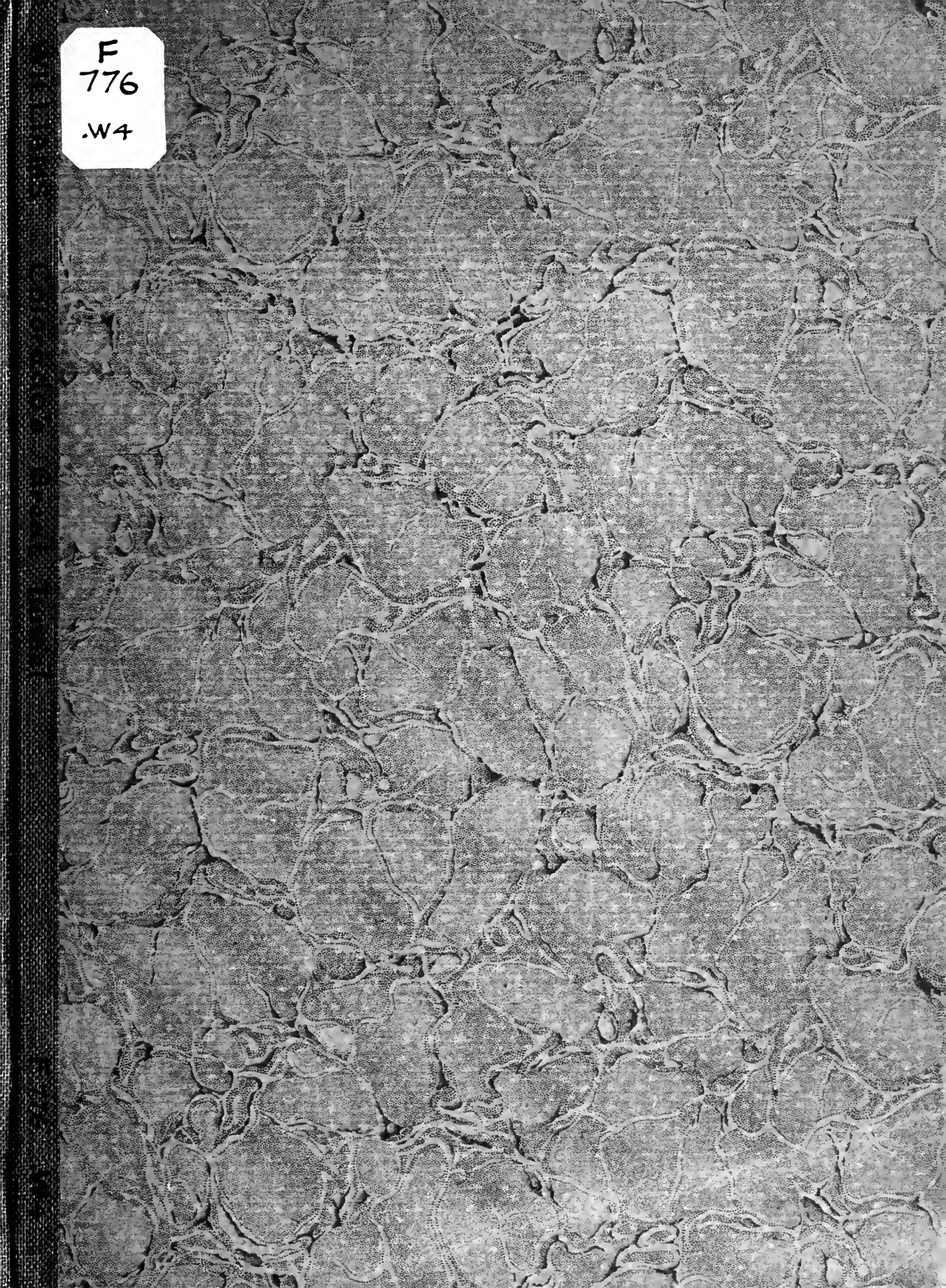
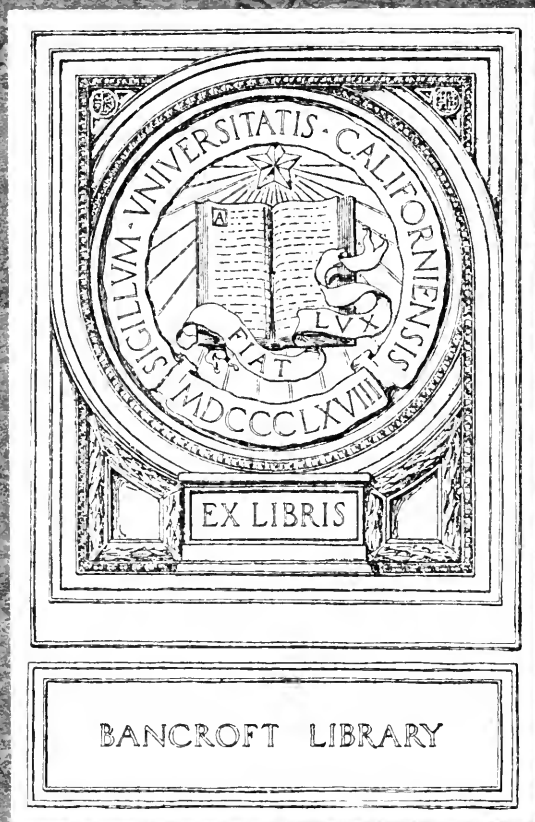


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A SECTION OF THE CITY OF DENVER, CAPITAL OF COLORADO, AND COMMERCIAL AND INDUSTRIAL CENTER OF THE ROCKY MOUNTAIN REGION

(The tunnel described in the following article pierces the Rockies at a point just to the left of the tower in the center of this picture)

COLORADO'S GREAT TUNNEL

BY WAYNE C. WILLIAMS

THE city of Denver—with counties lying adjacent—is about to begin construction of a six-mile tunnel under the Rocky Mountains. It will be the longest tunnel in North America and will connect the eastern and western slopes of Colorado. It is primarily a municipal project and has a genuine interest to American municipalities. Many of our municipalities are undertaking engineering projects, some involving utilities, others a new use of water-power, docks, sewage or railroads (as in the case of Cincinnati); but no American city has as yet undertaken to construct a tunnel of the dimensions and extent involved in this project.

It will be called the Moffat Tunnel, and therein lies the romance of the project. In order to understand this vast municipal undertaking, let us begin at the beginning: We shall take two facts, one physical and one commercial. Colorado is bisected from north to south by the great Continental Divide—the Rocky Mountains. These American Alps are a vast mountain chain dividing the two sections of the State.

Wonderful as they are—snowy peaks and rocky canons of surpassing beauty; mountain parks that form the chief playgrounds of America; vast glaciers that melt and yield swiftly running streams to feed the plains below and make cool temperatures for the city of Denver and the other cities of the State—all this Colorado has by right of Nature, by physical location; but the mountains are a formidable barrier to railroading. No satisfactory tunnel facilities exist for any railroad in Colorado and indeed no real tunnel facilities can now be said to exist at all. Every practical railroad man will understand at once the difficulties of moving trains over high mountain passes, with snowdrifts, grades, and storms to encounter. The Continental Divide forms a huge barrier to complete and satisfactory commercial and intellectual intercourse and to travel between the two sections.

The commercial fact is this, and it is a surprising one: The city of Denver is not on any direct transcontinental railroad line. It lies off the beaten path—so to speak—of

transcontinental railway routes. Its amazing growth into a great and beautiful city, its premiership among all the cities of the Rocky Mountain region, its absorption of the business of the great West, has come about, not because of its railroad facilities but in spite of a lack of them. For a generation the city has been under this handicap, and for even a longer period its far-sighted leaders of business and finance sought to put Denver on a transcontinental line.

Foremost among all these men was David H. Moffat, pioneer banker, railroad president and empire-builder. Other plans failing, Mr. Moffat determined at last to build the line himself, and one day he startled the business world, both of Denver and New York, by announcing that he would build a railroad over the Continental Divide. Moreover, he began at once to build it. Day by day the steel rails pushed steadily forward until one crowning day Mr. Moffat and a party of his friends stood at the top of the Continental Divide, at Corona Pass. He had overcome Nature's barrier and built to the eternal snows.

Then came obstacles. The great railroads that have their centers in New York were determined that Mr. Moffat should not build a transcontinental line to take business away from their own lines. They blocked him in his efforts to get money in the East. At every turn he found himself thwarted. Determined to realize his ambition to give Denver a transcontinental rail-

road connection he threw his own personal fortune into the scales, but even this did not avail. Mr. Moffat died almost penniless without his dream being realized, and for years it seemed that it never could be brought to fruition. The railroad stopped at the edge of the untapped resources of Northwestern Colorado and has since eked out a precarious existence.

Meanwhile the Moffat dream would not lie quiet. Foremost among those who had helped Mr. Moffat was Mr. William G. Evans, president of the Denver Tramway Company, leading capitalist and financier; the son of the late governor, John Evans of Colorado, who founded the Northwestern University and the University of Denver. Mr. Evans has been, and now is, untiring in his efforts to promote the tunnel. Other Denver and Colorado business men tried to secure State aid for a tunnel; for it was seen that only with a huge bore piercing the Continental Divide could the railroad be made successful. The legislature first passed a tunnel bill to provide this great improvement, but the courts held that the State could not in that way lend its aid and credit to the enterprise. Then the legislature submitted a proposed constitutional amendment, creating a tunnel commission with authority to build any tunnels needed. But here a new obstacle was encountered in the hostility of certain portions of the State, based on the alleged fear that a tunnel for a railroad out of Denver would divert general transcontinental traffic. They had other reasons—some of them weighty—but this was the paramount consideration. The tunnel amendment was defeated by a narrow margin. There was but one thing left to do—the city of Denver and the counties directly interested must build the tunnel. No private capital could be secured to undertake it.

Governor Oliver H. Shoup called the legislature in special session to deal with this situation and with another physical emergency. The city of Pueblo had been devastated by a flood a year ago, and needed legislation to enable it to create a flood district, to conserve its waters and avoid future disasters. The legislature passed two laws, one creating a flood district for the Arkansas River valley and one creating a tunnel district for Denver and adjacent counties. The laws were patterned after the Miami conservancy law in Ohio. The great disaster of the Dayton floods gave rise to legislation



PUTTING DENVER ON THE TRANSCONTINENTAL RAILROAD MAP

(The heavy black line shows approximately the location of the proposed railroad improvement)

there that forms a landmark for all future legislation of a similar character in this country.

After the laws were enacted, Governor Shoup at once named a commission to build the tunnel. The personnel of the Commission and of its consulting engineers is a distinguished one. The Commission is headed by W. P. Robinson of Denver, as president. The other members are Charles McAllister Willcox, Charles J. Wheeler, W. N. Blayney and Charles H. Leckenby. Mr. Leckenby is a prominent newspaper man. The others are leading Denver business men. Mr. Willcox is the head of one of the great department stores of the West, and is the son of General Orlando B. Willcox, who served with distinction under General Grant in the Civil War.

L. D. Blauvelt is the engineer, and the consulting engineers are David W. Brunton, of Denver; J. Vipond Davies, New York, builder of the Manhattan, Hudson and Pennsylvania tunnels, and J. Waldo Smith, also of New York. Mr. Smith was chief engineer and now is consulting engineer for the New York water-supply system.

The engineers have already made trips of inspection to the tunnel site and laid foundations for the driving of the great bore.

Norton Montgomery, a prominent Colorado lawyer, is the attorney, and former State Senator George Lewis, superintendent of the great Portland Mine of Cripple Creek, will be the assistant to the president and in active charge of the operations.

Actual construction was scheduled to begin about the first of September, and will not cease until the work is done. It is estimated that it will require four years to complete the work, over six hundred men being regularly employed during that period. The tunnel will start about fifty miles from Denver, just above the town of Tolland on the present Moffat road, and will pierce the north shoulder of James Peak, one of the mightiest monarchs of the main range. The eastern portal starts at an elevation of 9,190 feet and the western portal is at an elevation of 9,100 feet. The tunnel will be 6.3 miles long. It will be slightly raised near the center and drained both ways,

making the ends of the tunnel forty feet below the highest point in the interior. A tunnel bore eight by ten feet will first be driven and work will begin at both portals at the same time. The main tunnel will be sixteen feet wide and twenty-four feet high; it is proposed to build a pioneer tunnel beside the main bore that will aid in construction and afford an aqueduct to bring the waters of the western slope rivers to Denver and to the plains of eastern Colorado. This pioneer tunnel will also be used to carry power, light and compressed air to ventilate the main tunnel.



DAVID H. MOFFAT
(For whom the six-mile railroad tunnel under the Rockies will be named)

The construction problems, while interesting chiefly to engineers, present a number of aspects that will concern even the lay reader. The tunnel will be occupied by a single track and will be of concrete, where possible, and timbered where the rock is not strong enough to form the walls of the tunnel itself. The builders of the Moffat Tunnel are profiting by the valuable experience of engineers in constructing the Rogers Pass Tunnel on the Canadian Pacific Railway. This tunnel has been completed some four or five years. It is 5.2 miles long and is at present the longest railway tunnel in North America.

The Rogers Pass Tunnel, since named the Connaught Tunnel, is on the main line of the Canadian Pacific and pierces the Selkirk range in British Columbia. Rogers Pass had a snowfall of from thirty to fifty feet each winter and the cost of operating the road was so heavy that the tunnel became a necessity. A pioneer tunnel was also built in the construction of Connaught Tunnel.

The fundamental construction conditions of the two tunnels are much the same. If anything the Moffat tunnel presents more difficult obstacles than were offered to the engineers who constructed the big bore through Rogers Pass. The Canadian Pacific Tunnel builders had softer material through which to bore, this material consisting principally of schist, quartzite, some clay and some talc. The material through which the Moffat Tunnel builders must bore is largely granite.

The boring of a huge tunnel through the main range of the Rocky Mountains is not

unlike the building of a subway, yet every engineer will at once recognize the fact that the two operations are not identical. The difference in atmospheric conditions, for example, must be taken seriously into account. A lighter air at the high altitude of the Rockies makes it necessary to compress a greater volume in order to get sufficient air to the men who are at work. The air will probably be supplied as it was in the Rogers Pass Tunnel, through a wooden pipe. As an example of the close technical detail required on the part of the engineers, the matter of supplying air furnishes one of the most important features of the whole work—and the matter of air for workmen is not a detail at all—it is a fundamental. Previous tunnel-builders have tried the thin steel pipe, but the walls of this pipe do not hold up as well as a wooden wall.

Both tunnels will be straight. The Rogers Pass Tunnel is standing very well indeed, and no difficulties are anticipated either in the driving of the Moffat Tunnel or in its durability after completion.

The tunnel will cut out twenty-three miles of railroad over the top of the Continental Divide, as well as the snow-sheds and 4 per cent. grade. When we remember the engineers' estimate that snow conditions absorb 41 per cent. of the annual profits of the road, we can see the financial significance of the tunnel.

When completed the Moffat Tunnel will be a tremendous physical monument to American enterprise, to engineering skill, and to the man whose name it will bear. It will make the Moffat road a link in the shortest transcontinental railroad in America, and it will put Denver on that road. It will directly and vitally affect transcontinental railroading on all lines from the Atlantic to the Pacific. It will be a powerful factor in carrying goods to the unlimited markets of the Orient, and will help the cities of the Middle West and Northwest in their struggle to avoid the serious competition of shipping through the Panama Canal. The tunnel will enable the Denver & Rio Grande Western, which now detours by a circuitous route, to reach Salt Lake and the Pacific coast by building a short cut and thus save 171 miles. This cut-off will extend from Creston to Dotsero.

The tunnel will also insure the construction of a line from Salt Lake City to the

present terminus of the Moffat road in Colorado, opening rich lands of the Uintah Basin in Utah.

Certainly the most important effect of the tunnel will be the opening of the vast, untouched resources of northwestern Colorado and northeastern Utah. In Colorado this is called the "Routt County Empire." Here lie some of the greatest untouched beds of anthracite in the world—enough coal to supply the world for generations; over two thousand square miles of oil shale estimated to contain fifty billion barrels of oil; over ten billion feet of timber. Indeed it is quite within the bounds of reason to say that the tunnel opens up the richest single undeveloped spot on this continent, and will pour the commerce of this region into the lap of Denver and send new life-blood through its commercial veins.

This vast municipal undertaking is one in which other counties are to share. The entire Moffat Tunnel District, includes, besides City and County of Denver, all or a portion of the counties of Grand, Moffat, Routt, Eagle, Gilpin, Boulder, Adams and Jefferson.

Under the provisions of the law, property owners were given a specified period within which to object to the law or to the project. This period has passed and not a single property owner in the entire Tunnel District has filed an objection or a protest. Therefore there now exist no obstacles to the issuance of bonds, or to the commencement of the work of construction. The Tunnel Commission will shortly issue bonds to pay for the construction of the tunnel and not only will there be no legal obstacles to the issuance of these securities, but there will be back of them the vast wealth of the municipality of Denver and all the private property owned therein and the wealth of all the counties forming the district. Probably there has been no security offered in American markets in recent years with such a safe foundation as the bonds of the Moffat Tunnel will be found to possess.

Thus it remains for the city of Denver to undertake one of the greatest municipal projects ever known in American history, and the progress of the tunnel and its commercial and industrial possibilities form a theme that is interesting to scientific men, to capitalists, to laborers, and to students of American municipal life.

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